

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/CA2005/000462

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of:
 - ☐ international search (Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (Rule 12.4(a))
 - ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
 - ☐ the international application as originally filed/furnished
 - ☒ the description:
 - ☒ pages 1 to 17, 21 and 22 _____ as originally filed/furnished
 - ☐ pages* _____ received by this Authority on _____
 - ☐ pages* _____ received by this Authority on _____
 - ☒ the claims:
 - ☐ pages _____ as originally filed/furnished
 - ☐ pages* _____ as amended (together with any statement) under Article 19
 - ☒ pages* 13 to 20 received by this Authority on 27 July 2006
 - ☐ pages* _____ received by this Authority on _____
 - ☒ the drawings:
 - ☒ pages 1/8 to 8/8 _____ as originally filed/furnished
 - ☐ pages* _____ received by this Authority on _____
 - ☐ pages* _____ received by this Authority on _____
 - ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☒ The amendments have resulted in the cancellation of:
 - ☐ the description, pages _____
 - ☒ the claims, Nos. 10
 - ☐ the drawings, sheets/figs _____
 - ☐ the sequence listing *(specify)*: _____
 - ☐ any table(s) related to sequence listing *(specify)*: _____
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - ☐ the description, pages _____
 - ☐ the claims, Nos. _____
 - ☐ the drawings, sheets/figs _____
 - ☐ the sequence listing *(specify)*: _____
 - ☐ any table(s) related to sequence listing *(specify)*: _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1 to 9</u>	YES
	Claims	<u>NONE</u>	NO
Inventive step (IS)	Claims	<u>1 to 9</u>	YES
	Claims	<u>NONE</u>	NO
Industrial applicability (IA)	Claims	<u>1 to 9</u>	YES
	Claims	<u>NONE</u>	NO

2. Citations and explanations (Rule 70.7)

Reference is made to the following documents:

D1: US 2 339 848 (FEENEY) 25 January 1944 (25-01-1944)

D2: US 4 627 389 (SIMON) 9 December 1986 (09-12-1986)

D3: GB 2 384 525 A (STOTT) 30 July 2003 (30-07-2003)

Novelty:

Explanation provided with respect to Article 33 (2):

Claims 1 to 9 meet the novelty criteria as defined in PCT Article 33 (2).

Inventive step:

Explanation provided with respect to Article 33 (3):

D1 is considered to be the most relevant prior art document with respect to claim 1. D1 discloses a double action piston assembly including a combustion chamber (13) having a first end and a second end and containing a double action piston (19) connected to a power rod (45). The combustion chamber comprises a first intake port (59) and a first exhaust port (upper part of 7), a second intake port (57) and a second exhaust port (lower part of 7), valve assemblies (61 and 63) for opening and closing the intake ports (57 and 59) and the piston assembly (19) for opening and closing the exhaust ports. D1 also discloses a compression chamber (15) in alignment with the combustion chamber. The power rod passes through the lower wall of the combustion chamber into the compression chamber and out the lower end of the compression chamber to a connecting rod (35) and a crankshaft (33). The compression chamber further comprises a second piston (51), a first compression intake valve (column 6, lines 35) and a second compression intake valve (column 6, line 35) and conduit means linking the compression chamber to the combustion chamber (57 and 58). The combustion chamber further comprises means to inject fuel (83, embodiment of fig. 5) and ignition means (47 and 49) in both ends of the combustion chamber. Scavenging of the combustion chamber is achieved at each time the pistons reach an end of the chamber (top and bottom dead centres).

[X]See Supplemental Box

Box No. VII **Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

The application contains two pages numbered 17, the first page of the claims and the last page of the description. The claim pages should be renumbered 18, 19 and 20.

The abstract does not comply with Rule 8.1(b) and Rule 8.1(d) of the PCT. The abstract should be concise and each main technical feature mentioned in the abstract and illustrated by a drawing in the international application should be followed by a reference sign, placed between parentheses.

The following abstract would be acceptable:

A double action piston assembly for an internal combustion engine. The assembly comprises a combustion chamber (11) in axial alignment with a compression chamber (29) and in perpendicular alignment with a crankshaft (31). A connecting rod (44) has a first end connected to the crankshaft and a second end connected to a central power rod (8) itself connecting the compression piston (27) and the combustion piston (6). The central power rod traverse the compression and combustion chamber in their longitudinal axis. The combustion and compression chambers further include upper and lower inlet and outlet ports (12, 14, 34, 37, 13, 15, 35 and 38). The upper outlet port of the compression chamber is connected to the lower intake port of the combustion chamber and vice-versa. The upper and lower inlet ports of the compression chamber comprise means to introduce water (40, 41) into the compression chamber.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

Claim 1 of the present application distinguish itself from the disclosure of D1 in that it further includes:

A- a one piece power rod (8);

B- means to introduce water vapour (40, 41) in the compression chamber through the compression chamber intake valves;

C- a valve system further including valves positioned at the exhausts of the combustion chamber and at the exhaust of the compression chamber (the valves (61 and 63) of D1 being at the intake of the combustion chamber).

With regard to the distinguishing feature of a one piece power rod (A), it is clearly a design choice as it would be within the scope of the technical person skilled in the art to change the constructional design of the power rod without involving inventiveness or creating an unforeseen result.

With regard to the distinguishing feature of the means to introduce water vapour in the compression chamber through the compression intake valves (B), it is known in the art of diesel engine as disclosed in D3 to introduce water vapour into the intake air manifold upstream of the intercooler (page 2, last paragraph (5.3.2)). The disclosure of D3 is directed to a turbocharged diesel engine including a turbo compressor, a device similar in its effect on the intake pressure of the engine as the compression chamber of the present application. Thus the means to introduce water vapour in the compression chamber would be obvious in view of the disclosure of D3.

However, none of D1 or D3 alone or in combination discloses an internal combustion engine having the valves system disclosed in claim 1 (C) and thus the combination of the disclosure of D1 and D3 is not sufficient to cover all the features of claim 1.

Independent claim 1 and dependent claims 2 to 9 meet the inventive step criteria as defined in PCT Article 33 (3).

Industrial Applicability:

With regard to PCT Article 33 (4), claims 1 to 9 meet the industrial applicability criteria as defined in PCT Article 33 (4).